Ensuring Reliability and Resiliency of your Network: Grounding Standards for Cable Broadband Critical Facilities

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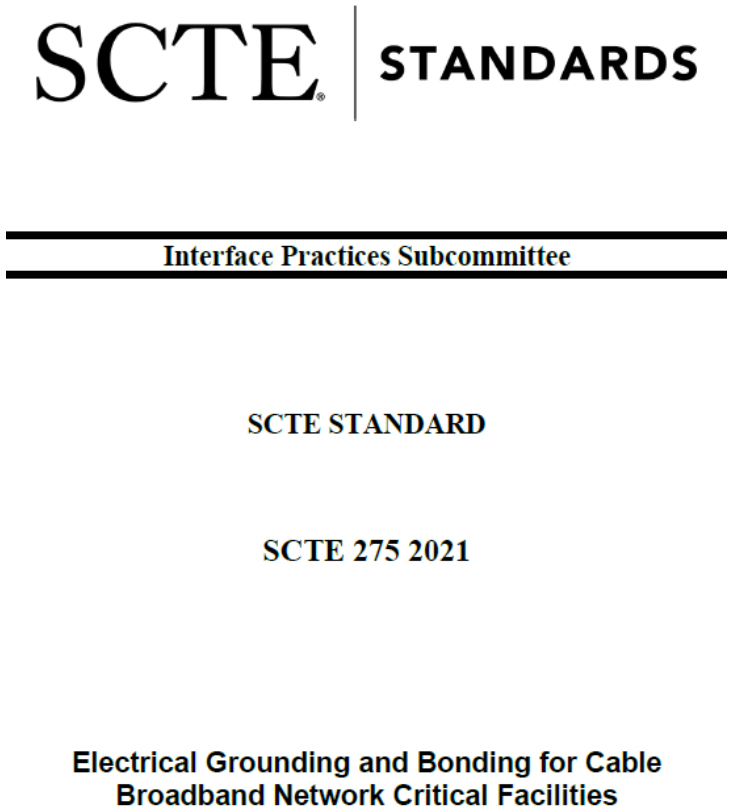
Reliability, Resilience and Network Continuity

- Critical facilities are foundational to the network and the delivery of lifeline telecommunications services
- All infrastructure systems must be fully functional at all times
- Cable operators always focus on maintaining robust and redundant systems, but how often do they overlook the proper grounding and bonding of these infrastructure systems?
- A single electrical storm or utility surge can wreak havoc on network equipment in a critical facility, often creating significant performance issues that cost valuable time and money to repair, potentially resulting in a loss of customers
- ANSI/SCTE 275 2021 brings together the best practices and cable industry expertise and experience, helping to guide cable operators in the deployment of grounding and bonding systems that will enable them to meet their reliability targets and ensure resilience and continuity of the network

Grounding and Bonding Task Force

- MSO contributions from Cox, Comcast, Shaw, Rogers, and Charter
- The Working Group reviewed current grounding practices of each of the MSOs over a period of 3 years
- Grounding and bonding standards from electrical and telecommunications industries were also reviewed
- A ‘matrix’ document comparing the specific practices and requirements was developed and maintained



Overview of ANSI/SCTE 275 Content

- Exterior Grounding and Bonding System
- Interior Grounding and Bonding System
- Surge and Lightning Protection Systems
- Environmental Handling for ESD Sensitive Devices
- Commissioning and Maintenance
- Appendix - Sample Commissioning Checklist

Why We Need This Standard

A reliable low impedance grounding and bonding system is important in communication networks for the following reasons:

- Personal Safety
- Equipment Protection
- Equipment Operation
- Electrical Noise Reduction
- Reliability & Resilience

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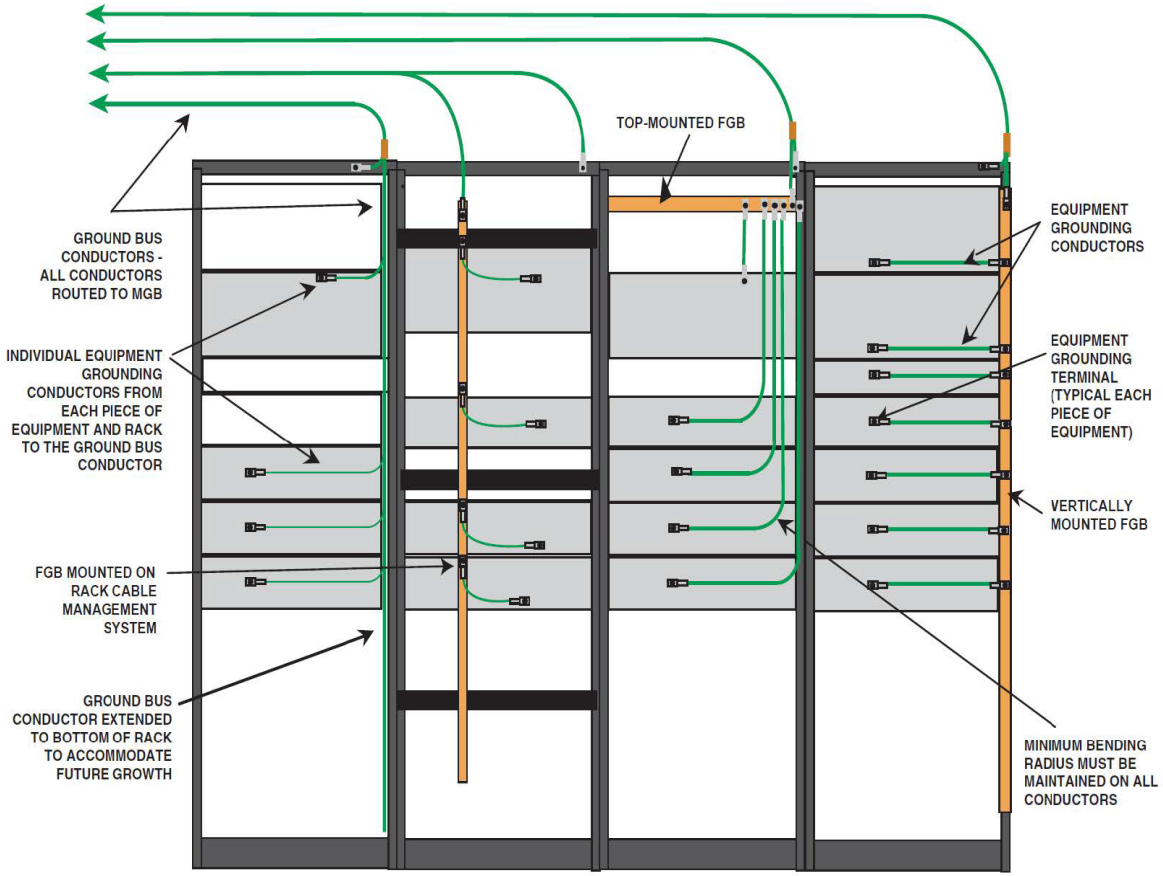
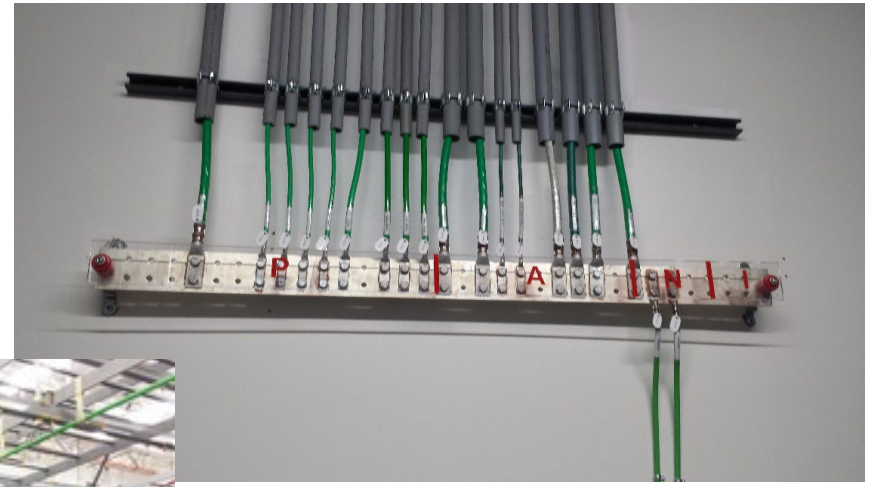
Challenges

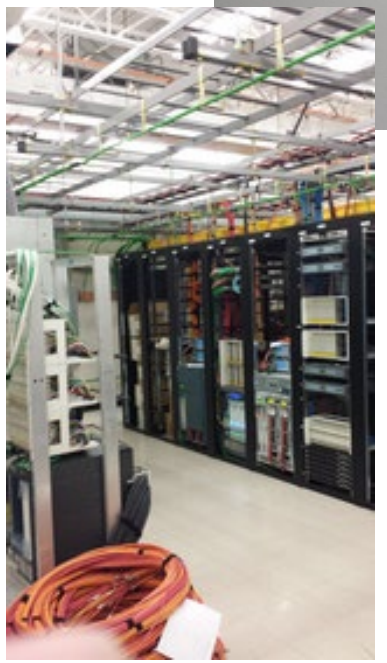
- Variations in intent and approach
  - From basic to ‘overkill’
- Collecting & aggregating specs
  - Similarities & differences
- Foundational to safety & reliability
  - Awareness & education
- Large amount of reference material
  - Dozens of specifications, standards and white papers were reviewed

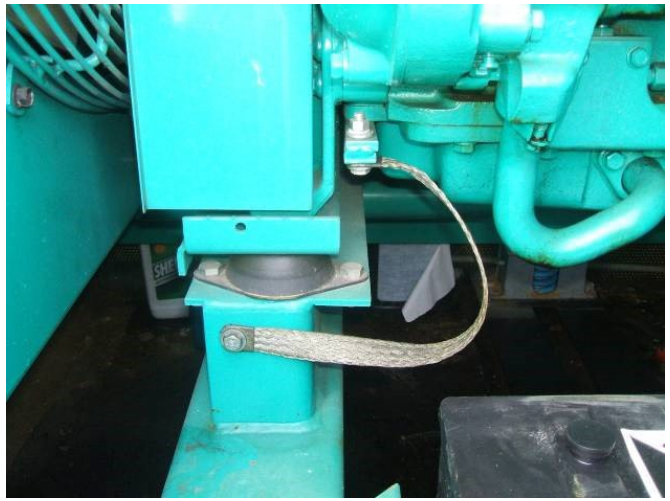


Benefits

- First grounding standard for MSO industry
- Brings together various specifications
- Lays the groundwork for safety & reliability of Critical Facilities from engineering design through ongoing maintenance
- Can be used to ensure vendors are using a standardized approach
- Commissioning checklist
- Educational opportunity for engineers and technicians



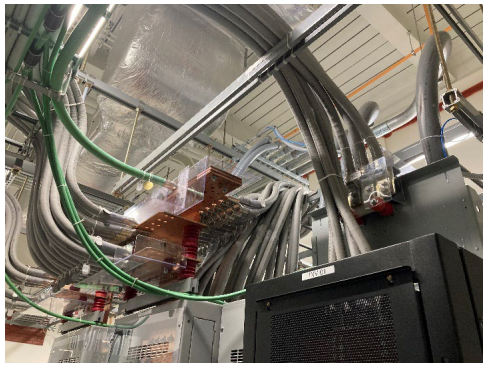




Exterior Grounding System

- Soil types & resistivity
- Tower grounding
- Exothermic welding
- Dissimilar metals
- Ground rings
- Inspection

Interior Grounding System



- Single-point ground
- Ground zones
- Master Ground Bar
- Equipment grounding
- Rack & frame grounding
- Cable entrance grounding

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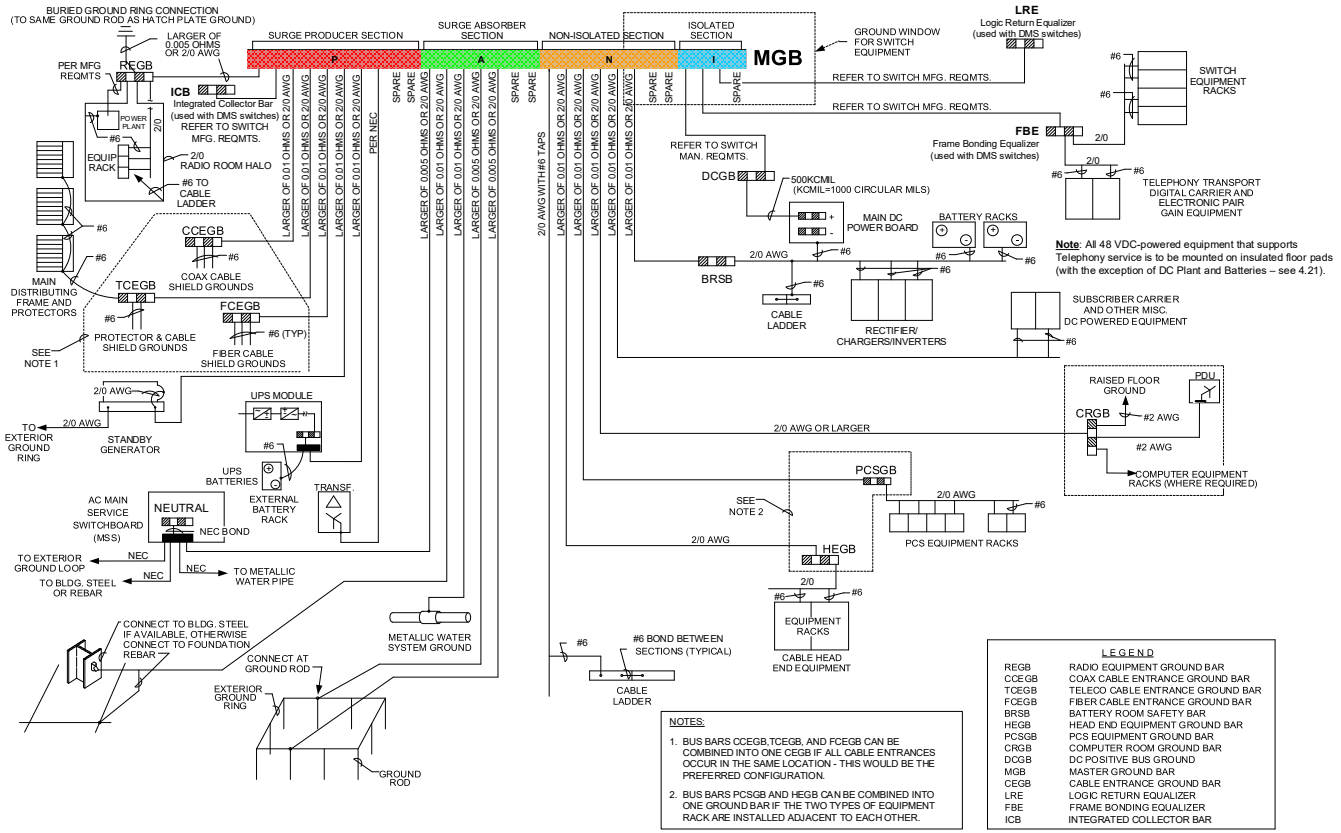
PANI MGB Configuration

The Grounding Configuration Concept used by Cox to fulfill the need to equalize and arrange surge potentials by specific classifications, groupings and terminations of the grounding system elements onto the MGB, namely:

- **P -Surge Producers** - typically, conductors coming from Cable Entrance Ground Bars, as well as Generator, UPS, and Transformer enclosures
- **A -Surge Absorbers** - typically contains connections to building steel, the exterior Ground Ring, the cold-water pipe, if metallic, and the incoming Main AC Service ground bar –the Multi-Ground Neutral bond
- **N -Non-Isolated Ground Zone** Equipment Grounds - typically includes Secondary Ground Bars for equipment 'Aisle Feeder Ground Conductor' Cabinet/Rack grounds, Ladder Rack, etc.
- **I -Isolated Ground Zone** Equipment Grounds - typically equipment associated with the DMS switch, Logic Grounds and the DC Plant Reference Ground

Cox Critical Facility Ground System Schematic



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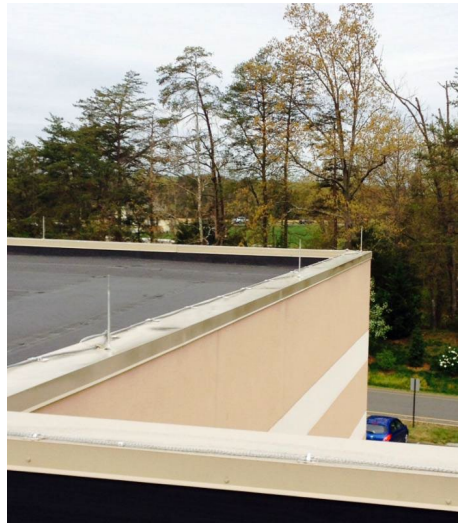
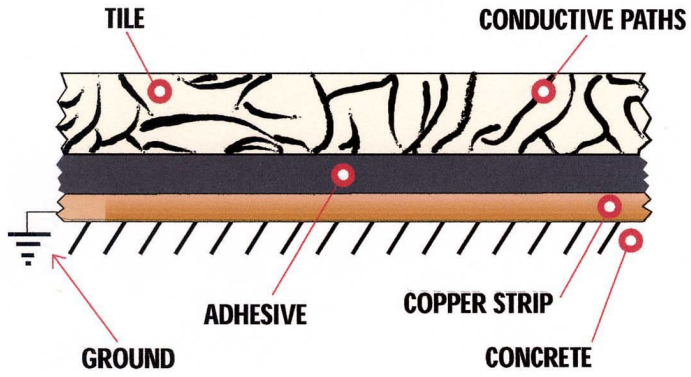
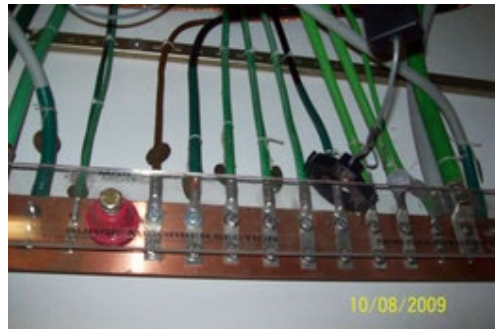
Surge and Lightning Protection Systems and Electrostatic Discharge

- Surge protection at multiple levels
- Lightning protection in all regions
- LPS tied to ground ring
- Humidity monitoring
- ESD floor tile
- Wrist straps





Commissioning and Maintenance



GROUNDING AND PROTECTION SYSTEM COMMISSIONING CHECKLIST

Name of Site: _____ **Location:**

Name of Inspector: ____ **Date:**

	YES	NO	N/A
A. Exterior Grounding System			
1. Were soil resistivity measurements made prior to the design of the grounding system?	☐	☐	☐
2. Was the exterior grounding system design based on these soil resistivity measurements and the soil boring report?	☐	☐	☐
3. Did the exterior grounding system resistance measurement meet the design criteria of 5 ohms or less?	☐	☐	☐
4. Is there a properly sized (#2 AWG minimum) bare copper grounding conductor buried around the building?	☐	☐	☐
5. Is this buried ground ring installed below the frost line or 30 inches, whichever is greater?	☐	☐	☐

- Critical to building function
- Safety & reliability
- Commissioning checklist
- Periodic system testing
- Visual inspections

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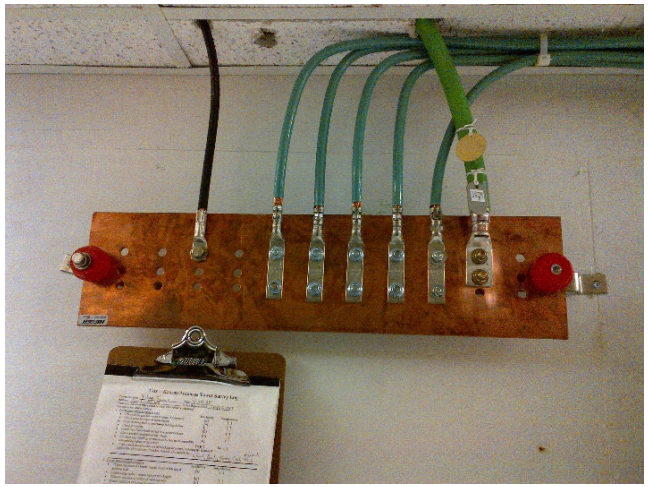
Summary

- Cox (and most Telecom) standards go beyond typical NEC and Commercial standards
  - 5 Ohm resistance-to-ground (as opposed to 10 or 20 Ohm)
- Ground ring with multiple driven 10’ ground rods, spaced at least 20’ apart
  - 2 connections to Master Ground Bar
- Single-point ground concept
- ‘PANI’ Master Ground Bar Configuration
  - More so for efficient ‘administration’ and troubleshooting than playing ‘lightning traffic cop’
- Tower grounding and lightning protection held to specific stringent standards
- Static electricity management/mitigation
- 2-hole lugs or ‘serrated’ washers, use NO-OX, ALWAYS scrape paint prior to termination
- NO ‘daisy-chain’ or multiple-point bonding
  - Enables better troubleshooting

Takeaways

- Differences of intent and approach to grounding
  - ANSI/SCTE 275 provides a harmonized & standard approach
- Proper grounding & bonding is foundational to:
  - Personnel safety
  - Building integrity
  - Equipment & network reliability
- Use the ANSI/SCTE 275 standard document for:
  - Engineers & technicians
  - Vendors & contractors
  - Education & training
  - Ensuring resilience & network continuity



Questions?

Thank You!

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